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Original article

Orthogeriatrics service for hip fracture patients in Dunedin Hospital: Achieving standards of hip fracture care

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ABSTRACT

Purpose: To evaluate the orthogeriatrics service (consult liaison provided by geriatricians on an orthopedics ward) for hip fracture patients in Dunedin Hospital and to assess how well standards of hip fracture patient care were achieved. These standards (adapted from British Orthopaedics Association) include admission to ward within 4 hours, surgery within 48 hours, assessment and care to reduce pressure ulcer risk, access to orthogeriatrics services, and secondary prevention of falls and osteoporotic fractures.

Methods: This retrospective audit reviewed patients above age 65 years admitted to the orthopaedic service in Dunedin Public Hospital with a neck of femur fracture between January 1, 2010, and December 31, 2010.

Results: There were 144 patients with median age of 86 years. 24.5% were admitted to the Orthopaedics ward within 4 hours: 70.8% had surgery within 48 hours and 73.6% had pressure ulcer assessment completed as per our hospital protocol. One-third was seen by the orthogeriatrics team on the day of surgery or earlier. History of falls was not documented in about one third of patients. Only 20.8% had postural blood pressure measured, and 35.6% of those discharged home had a home visit. About 30% did not have documentation of previous fractures, and one-quarter were not assessed for consideration of bisphosphonate therapy. Inpatient mortality was 9%.

Conclusions: Several areas for improvement were identified from this retrospective study. Suggestions for achieving the standards of hip fracture care are provided. Further audit after implementing these changes is recommended.

1. Introduction

Hip fractures in the elderly cause significant loss of independence, risk of requiring residential care and increased morbidity and mortality.[1,2] The restriction in activities of daily living can be prolonged, with more than half not regaining baseline mobility, and still limited in housework, gardening and transport 1 year later.[3]

Although there are several models of ortho-geriatric care for hip fracture patients, it is unclear which is the most effective due to heterogeneity of studies.[4] The focus is rehabilitation and a multidisciplinary approach to reduce hospital length of stay and improve functional recovery.[5]

Several guidelines and publications are available providing evidence based recommendations for hip fracture patients.[6–8] The standards of hip fracture care recommended by the British Orthopaedic Association include admission to the ward within four hours, surgery within 48 hours, assessment and care to reduce pressure ulcer risk, access to orthogeriatric input and secondary prevention of falls and fractures.[6] These guidelines also recommend regular audit of orthogeriatric services to ensure quality assurance. This paper discusses results of an audit performed on the orthogeriatric service in Dunedin Hospital to assess how well these standards of hip fracture patient care were achieved.

Dunedin Hospital is a tertiary hospital located in Otago, New Zealand. There are 388 beds, providing medical services to a population of about 182,000. It provides Orthopaedic surgery services for the rural hospitals in the greater Otago region, namely Alexandra, Balclutha, and Oamaru.

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The orthogeriatric model of care in Dunedin is such that patients with hip fractures are admitted under the Orthopaedics team in an Orthopaedic ward. Ward rounds by a geriatrician and/or geriatric medicine registrar occur Monday to Friday during normal working hours with the orthopaedics house officer. A consultative service is provided for acute medical problems in hip fracture patients preoperatively as required, and all patients over 65 years with a fracture are routinely seen postoperatively.

Formal multidisciplinary meetings are held weekly to discuss patient management and progress. If patients require further rehabilitation post-operatively, they are wait-listed for transfer to the Older Persons Health ward. However, patients living closer to rural hospitals are transferred after postoperative monitoring to their respective hospitals for further rehabilitation and discharge planning.

The referral process for rehabilitation is usually initiated by the orthogeriatric team. Once transferred to rehabilitation, the patients are under the care of the geriatrician (or physician in the case of smaller centers).

2. Methods

This retrospective audit reviewed patients above age 65 years admitted to the orthopaedic service in Dunedin Public Hospital with a neck of femur fracture between January 1, 2010, and December 31, 2010. The orthopaedic department has an electronic database from which patients with fractured neck of femur were identified. Clinical notes for these patients were reviewed manually and data entered electronically on Microsoft Excel spreadsheet.

Patients were excluded from the audit if they were below 65 years of age, had trochanteric fractures or periprosthetic fractures.

Patient case mix data includes patient demographics, pre-fracture residence, walking ability and level of independence, and fracture type. Details regarding the journey of care from admission to discharge include time taken from the emergency department to the ward, time to surgery, surgery performed, time taken for medical assessment by the geriatric team, length of acute hospital stay and inpatient rehabilitation, as well as destination on discharge.

In New Zealand, the levels of residential care include the following:

- *Rest home:* Residents mild to moderately dependent needing some assistance with activities of daily living and night cares, but not nursing care.
- *Dementia rest home:* Residents with challenging behavior assessed by psych-geriatrician as requiring special care and close monitoring with restricted access outside the facility.
- *Hospital level care:* Residents requiring long-term nursing care and is always staffed by at least two people, with a registered nurse present at all times.

The percentage of patients meeting standards of hip fracture care[6]; admission to ward within 4 hours of presentation, surgery within 48 hours, assessment for pressure ulcers, orthogeriatric review were calculated.

Our hospital standard for pressure ulcer assessment was completing the Braden Chart within 4 hours of admission, with subsequent assessments depending on patient risk. This was reviewed in the audit.

If confusion was documented in the notes by nursing or medical staff, it was determined whether a diagnosis of delirium was made and whether objective cognitive testing was performed. Patients were considered to have a history of cognitive impairment if they had documented short-term memory loss, cognitive dysfunction, dementia, or previous Mini Mental State Exam (MMSE) less than 25.

Falls assessment data include number of previous falls within the last 6 months, whether nature of falls was documented, postural blood pressure, occupational therapy and home visits (if discharged home), as well as medication review for drugs associated with increased falls risk (benzodiazepines, sedatives, antidepressants, and antipsychotics).

Fracture assessment data include previous fractures, whether plasma calcium/phosphate was measured, osteoporosis medications on admission, and discharge, as well as whether bisphosphonate treatment was considered. The percentage of patients returning home from hospital and inpatient mortality was also calculated.

3. Results

3.1. Patient case mix

There were 144 patients admitted with neck of femur fractures during the year. The median age of patients was 86 years (range: 65–101 years). There were 43 (29.9%) male patients, and 101 (70.1%) female patients.

3.2. Prefracture residence

On admission, 88 (61%) patients were living at home, 43 (29.9%) patients were from a rest home, five (3.5%) were from dementia rest homes, and eight (5.6%) were from hospital level care.

Of the 88 patients living at home, two (2.3%) were main carers, 51 (58%) were independent with activities of daily living, 27 (30.7%) had non-daily carers, seven (8%) received daily carers, and one (1.1%) patient lived with a carer.

3.3. American Society of Anaesthesiologist (ASA) grade

A list of patients per ASA grade is listed in Table 1.

Table 1
ASA grade of patients.

ASA grade	1	2	3	4	Not documented	No surgery
Number of patients, %	2 (1.4%)	31 (21.5%)	73 (50.7%)	11 (7.6%)	21 (14.6%)	6 (4.2%)

3.4. Walking ability

A total of 63 (43.8%) patients walked without aids. A total of 25 (17.4%) required a stick or crutch to mobilize; two (1.4%) patients used two sticks or crutches to walk. A total of 48 (33.3%) needed a frame. Three (2.1%) patients did not have their walking ability documented and 3 (2.1%) patients were unable to walk (bed-bound).

A total of 41 (28.5%) were accompanied to walk, while 103 (71.5%) were not.

3.5. Fracture type

Fracture type is listed in Table 2.

Table 2
Fracture by type.

Type of fracture	Number of patients, %
Intertrochanteric	62 (43.1%)
Intracapsular:	
Undisplaced	21 (14.6%)
Displaced	56 (38.9%)
Subtrochanteric	5 (3.5%)

3.6. Journey of care from admission to discharge

3.6.1. Time from emergency department to ward

Data for time to admission from the emergency department (ED) to the ward was analyzed for 143 patients. A patient initially admitted with back pain, who then fell and sustained a hip fracture resulting in transfer to an Orthopaedics ward was excluded.

Median time from ED to ward was 5 hours and 10 minutes (range: 1 hour 1 minute to 15 hours 4 minutes).

A total of 35 (24.5%) patients were admitted within 4 hours, while 108 (75.5%) remained in the ED for a longer duration.

3.6.2. Surgery within 48 hours

Six patients did not have surgery while one did not present via the ED. For the remaining 137 patients, time from presenting to ED to theatre is shown in Fig. 1.

Median time to surgery was 40 hours 28 minutes (range: 10 hours 23 minutes to 337 hours 23 minutes).

A total of 97 patients (70.8%) had surgery within 48 hours, while 40 (29.2%) had surgery after 48 hours. A total of 89.8% were done during normal working hours (8 AM to 6 PM).

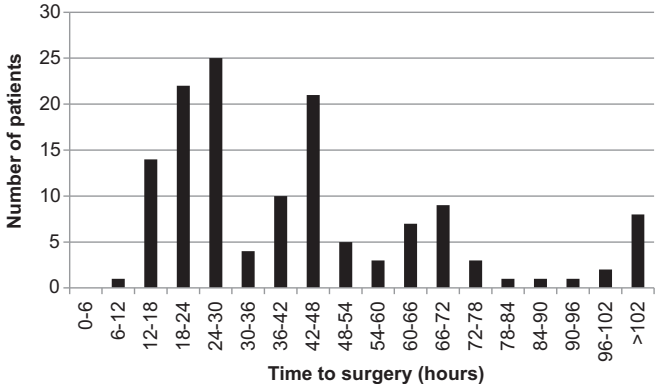

Fig. 1. Graph showing distribution of patients and time to surgery.

3.6.3. Reason for delay

The two patients treated conservatively had intertrochanteric fractures, with follow-up organized in 4 weeks (Table 3). Both had poor premorbid function; one was wheelchair bound, the other had dementia occasionally mobilizing with frame.

Table 3
Reason for surgical delay.

Reason for delay	Number of patients
Delayed consent	1
Delayed diagnosis	2
Initially treated conservatively	2
Medically unfit: (14)	
Cerebrovascular event	2
Cardiac event	3
Reversal of international normalized ratio	5
Chest infections	3
Electrolyte imbalance	1
Theatre unavailable	20 (43.5%)
Other: echo requested	1
No surgery: (6)	
Unwell and died preoperatively	4
Conservative treatment	2

3.6.4. Type of surgery performed

For the 138 patients who underwent surgery, 67 (48.6%) had dynamic hip screws (DHS), 15 (10.9%) had cannulated screws, 39 (28.3%) had cemented hemiarthroplasty, 12 (8.7%) had total hip joint replacements (THJR), and five (3.6%) had long Intramedullary (IM) nail.

Table 4 summarizes the patients according to fracture type and surgery performed.

Table 4
Fracture type and surgery performed.

	DHS	Cannulated Screw	Hemi-arthroplasty	THJR	IM nail	No surgery	Total
Intertrochanteric	55	2	—	—	2	3	62
Intracapsular Undisplaced	8	11	1	—	—	1	21
Intracapsular Displaced	2	2	38	12	—	2	56
Subtrochanteric	2	—	—	—	3	—	5
Total	67	15	39	12	5	6	144

DHS = Dynamic Hip Screw; IM = Intra-Medullary; THJR = Total Hip Joint Replacement.

3.6.5. Pressure ulcer assessment

Assessments for pressure ulcers were completed as per our hospital protocol for 106 (73.6%) of our patients. A total of 12 (8.3%) patients did not have the assessment performed, 21(14.6%) had a delay in assessment of more than 4 hours, three were acutely unwell/dying, and two did not have times of completion documented.

3.6.6. Cognitive impairment and confusion

A total of 56 (38.9%) patients had a history of cognitive impairment documented, while 88 (61.1%) did not. During the admission, including postoperatively, nursing staff noted that 72 (50%) patients were confused in the ward. Two patients with previous diagnosis of cognitive impairment were not noted by nursing staff to be confused.

Of the 72 patients with documented confusion, the diagnoses were as follows:

29 (40.3%) patients had dementia documented as the reason for confusion. A total of 26 (36.1%) patients were diagnosed with delirium, while 17 (23.6%) were not given a diagnosis or explanation for their confusion.

A total of 51 out of 72 (70.8%) of the confused patients did not have formal cognitive assessments done.

3.6.7. Medical assessments

A total of 114 (79.2%) patients were routinely reviewed by the geriatrics service on the ward, while 18 (12.5%) required acute medical or geriatric service review. Three (2.1%) were already under a medical or geriatrics team. nine (6.3%) were not reviewed medically.

Median time taken for review by geriatric service is 1 day postsurgery.

Of the 131 patients who were seen by the geriatric service and had surgery, 39 (29.7%) patients were seen on the day of surgery or earlier.

3.7. Falls risk assessment

3.7.1. History of previous falls (in the last six months) documented

If the patient has dementia and is unable to provide a history, and falls were unwitnessed, this was coded as “unclear history” (Table 5).

Table 5
History of falls in the previous 6 months.

Number of falls	Number of patients (%)
None	42 (32.1%)
One	3 (2.3%)
Two to four	13 (9.9%)
Five or greater	4 (3.1%)
Unclear history	29 (22.1%)
Not documented	40 (30.5%)

3.7.2. Documented nature of falls

A total of 51 (38.9%) of patients had the nature of falls documented, while 51 (38.9%) did not. The remaining 29 (22.1%) had cognitive impairment and were unable to provide a falls history.

3.7.3. Other components of falls assessment

Table 6 only includes patients discharged from Dunedin Hospital (101 patients), as details of these assessments for patients transferred to rural hospitals were not accessed.

In some patients, a home visit is not applicable as they are in residential care.

Table 6
Other components of falls assessments.

	Yes	No	Not applicable
Postural blood pressure	21 (20.8%)	80 (79.2%)	—
Occupational therapist assessment	57 (56.4%)	44 (43.6%)	—
Home visit	16 (35.6%)	29 (64.4%)	56
Cognitive assessment	27 (26.7%)	74 (73.3%)	—

3.7.4. Medications associated with increased falls risk

A total of 54 (41.2%) patients were on these medications; 18 (13.7%) were on benzodiazepines, seven (5.3%) were on sedatives, 41 (31.3%) were on antidepressants, and 28 (21.4%) were on antipsychotics. They were stopped or reduced in 12 of the 54 (22.2%) patients.

3.8. Fracture assessment

3.8.1. History of previous fractures

This was not documented in 42 (29.2%) of patients. 54 (37.5%) had no previous fractures. In the remaining 48 (33.3%) with previous fractures, the three most frequent site of previous fracture were the hip, humerus, and vertebrae.

3.8.2. Bone-sparing therapy

Bone-sparing therapy results are shown in Table 7.

Table 7
Bone-sparing therapy.

Bone Sparing therapy	Admission, %	Discharge, %
Calcium	20 (15.3%)	23 (17.5%)
Bisphosphonate	18 (13.7%)	48 (36.6%)
Vitamin D analogue	49 (37.4%)	118 (90.1%)
Cholecalciferol	48 (36.6%)	116 (88.5%)
Calcitriol	1 (0.8%)	2 (1.5%)

3.8.3. Bisphosphonate therapy

A total of 14 (10.7%) continued alendronate from admission, 31 (23.7%) were started on alendronate, while 2.3% were started on zoledronic acid. Eleven (8.4%) were for outpatient Dual-energy X-ray absorptiometry (DEXA) scan to help determine benefit of bisphosphonate, and two (1.5%) were for outpatient General Practitioner (GP) review whether bisphosphonate was appropriate.

A total of 39 (29.8%) patients were documented as not appropriate for bisphosphonates, while 31 (23.7%) patients did not have assessment or consideration of these bone-sparing treatments documented.

3.8.4. Calcium/phosphate measurements

A total of 96 (73.3%) patients had their calcium and phosphate measured during admission.

3.9. Patient outcomes

3.9.1. Length of stay

A total of 130 patients were analyzed. Thirteen patients died, while one was discharged to a rest home attached to Oamaru hospital. Median overall length of stay was 16 days (range: 3–74 days). Median length of stay in acute orthopaedics ward was 10 days (range: 3–31 days).

A total of 67 (51.5%) patients went to a rehabilitation ward. Table 8 summarizes the patients' rehabilitation destination and length of stay in rehabilitation.

Median time from referral being sent to rehabilitation ward was 5 days (range: 1–16 days), while median time from surgery to rehabilitation ward was 10 days (range: 8–19 days).

Table 8
Rehabilitation destination and length of stay in rehabilitation.

Rehabilitation site	Number of patients, %	Median rehab length of stay, d	Range, d)
Older Persons Health, Dunedin	39 (58.2%)	18	7–64
Oamaru	9 (13.4%)	11	5–22
Dunstan	13 (19.4%)	14	3–28
Balclutha	6 (9%)	17	10–24

3.9.2. Reoperation within 30 days

One patient who underwent a total hip joint replacement required reduction of a dislocated prosthesis.

Table 9
Discharge destination.

Prefracture residence	Number, %	Discharge destination	Number, %
Home	80 (61.1%)	Home	64 (80%)
		Rest home	14
		Private hospital	2
Rest home	38 (29.0%)	Rest home	19 (50%)
		Private hospital	19
Dementia rest home	5 (3.8%)	Dementia rest home	3
		Private hospital	2
Private hospital	8 (6.1%)	Private hospital	8

3.9.3. Discharge destination

A total of 94 (65.3%) were discharged to the same destination, while 37 (25.7%) patients moved to a facility that provided higher-level care Table 9 summarises the discharge destination according to patient's pre-fracture residence.

3.9.4. Inpatient mortality

A total of 13 (9%) patients died in hospital: four preoperatively, one perioperatively, and eight postoperatively.

4. Discussion

The standards for hip fracture care recommended by the British Orthopaedic Association are as follows: admission within 4 hours,

hip surgery within 48 hours, assessment and care to reduce pressure ulcer risk, access to orthogeriatrics input, and assessment for prevention of osteoporotic fractures and subsequent falls.[6] Guidelines aim toward best practice to improve care and reducing patient mortality. Compliance can only be made through audit and recognizing areas for improvement. This audit is a quality assurance project reviewing the Orthogeriatrics service in Dunedin Hospital.

Admission within 4 hours was achieved in our hospital for less than one-quarter of patients with hip fractures. Further assessment into contributors for delay is necessary, as delayed admission is associated with increased length of stay and hospital mortality.[9] Dunedin has a fast track admission protocol for hip fractures to reduce admission time. The admission process is also currently being reviewed, triggered by a Ministry of Health target of 6 hours for all admissions via the ED.[10]

Median time to theatre is 40 hours. This time to surgery is similar to previously published data for Christchurch[11] (43.5 hours) and Middlemore Hospital (44 hours).[12] Northshore Hospital has significantly shorter times to surgery (21 hours), with 58% having surgery within 24 hours, which may be due to performing surgery after hours for neck of femur fractures.[12] The percentage of patients having surgery within 24 hours in Dunedin (27%) is similar to Middlemore (26%) and Auckland (24%).[13]

The main reason for delay in medically well patients was theatre unavailability. Extra theatre lists for hip fractures may be required. However, one study did not show any significant change in time to surgery with introduction of extra trauma lists.[14] The authors suggest this is due to multiple factors, which need to be identified before improvement is achieved.

Pressure ulcer assessment was not documented in 8.3% of patients. There is currently no record of pressure ulcer prevalence in our hospital. Patients with hip fractures are at increased risk of developing pressure ulcers, which are associated with complications including infection, prolonged length of stay and higher cost.[15] Documented incidence of pressure ulcers will be required to assess the magnitude of this issue in our hospital.

One-half of the patients were noted by nursing staff as being confused, and one-quarter without a documented explanation for this. About two-fifths of patients had the confusion attributed to dementia. However, it was unclear whether they are at their baseline confusion or with superimposed delirium. Delirium is common postoperatively and remains poorly diagnosed, even with use of tools such as the Confusion Assessment Method[16] (which is not utilized in our hospital). Also of concern is the low proportion of confused patients (29.2%) having cognitive assessments performed. Improving recognition of delirium is required. Educating staff on diagnosing delirium, including use of Confusion Assessment Method tool, should be considered. A meta-analysis reviewing incidence of delirium after orthopedic surgery shows significant variability with heterogeneity between studies with differences in methods of diagnosis, thus advising a more standardized approach.[17]

Almost 80% of the patients were reviewed routinely by the geriatric service, with median time for review the day postsurgery. The proactive case finding efforts should be continued to maintain a high pick up rate of hip fracture patients to provide standard care.

Prevention of falls is vital in secondary prevention of hip fractures.[18] Approximately one-third of patients did not have a documented falls history, including frequency and nature of falls. Only one-fifth of patients on psychotropic medications, which increases the risk of falls, had their medications reduced or stopped (although it was unclear in which patients it was inappropriate to discontinue these medications). Postural blood pressure was not measured in more than one-half of the patients. Other hip fracture services have a dedicated falls clinic assessment, which may need to be considered in our hospital for further assessment after recovery from hip fracture.[19,20]

With regard to bone sparing therapy, there is a good uptake of prescribing cholecalciferol after hip fracture. In one-quarter of patients, there was no assessment whether bisphosphonates were appropriate or not. Osteoporosis is generally undertreated in hip fracture patients.[21] A protocol in our orthopaedics and rehabilitation ward for osteoporosis treatment could be introduced, as it has been shown to improve rates of treatment.[22] As an aside, prescription of calcium supplements did not change significantly after admission with hip fracture. Enthusiasm for its use has declined due to uncertainty regarding its cardiovascular risk.[23]

The overall median length of stay post hip fracture (16 days) is similar to North Shore Hospital (16.5 days),[12] which were shorter compared to Middlemore Hospital (19 days),[12] Christchurch (23 days),[11] and Auckland (23 days if fast tracked or 28 days).[13] The reduced length of stay was possibly from early discharge planning with the multidisciplinary team starting in Orthopaedics ward postoperatively and early initiation of referrals for rehabilitation if deemed appropriate.

Hip fracture patients have up to eight times increased likelihood of mortality in the first 3 months.[24] The inpatient mortality rate of 9% was higher than our New Zealand counterparts (Christchurch 0.7%, Middlemore 2.9%, Northshore 4.8%, Auckland 5%).[11–13] This was similar to the 30 day mortality from the British audit (8.4%).[19]

Recommendations that can be considered to improve this orthogeriatric service are as follows: There is a need to identify causes of delay in patient admission and surgery, and these need to be remedied. This may include providing an extra theatre list or allocating hip fracture surgery to quieter theatre times, such as before 10 AM.

Educational sessions may be required to improve knowledge and experience of treating hip fracture patients. Treatment guides including checklists[25] should be made available for house officers. Protocol driven approaches may be required to improve uptake of interventions for falls and osteoporosis treatment. Diagnosis and awareness of delirium needs to be improved. Finally, further audit after introducing these changes should be done to ensure that we continue to improve in achieving standards of hip fracture care.

In summary, this study describes the patient case mix of hip fracture patients and their journey of care from admission to discharge. This audit assesses whether we are achieving some of the key standards of orthogeriatric care. It also identifies areas for improvement, which we can focus on to improve service provision and overall patient care.

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